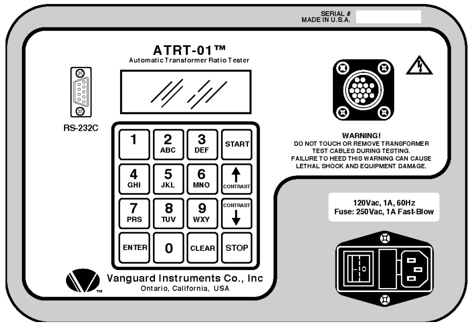
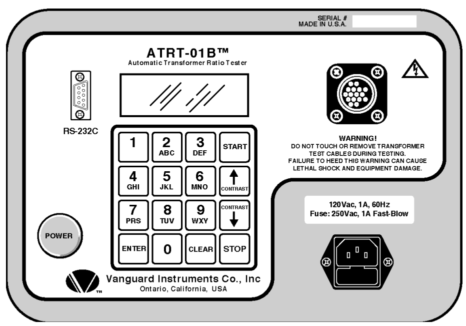
OPERATING INSTRUCTIONS

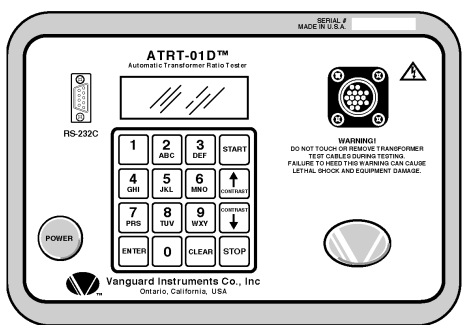
for

Models ATRT-01, ATRT-01B, and ATRT-01D

Single Phase Transformer Turns-Ratio Meter







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NOTICE

This manual applies to Models ATRT-01, ATRT-01B, and ATRT-01D; the operating procedures are virtually the same for all models; any differences, which relate to the test units' power sources, are clearly described within the step-by-step procedures.

SAFETY WARNINGS AND CAUTIONS

This device shall be used only by trained operators.
All transformers under test shall be off line and fully isolated

Do not Service or Test alone.

Do not perform test procedures or service unless another person is also present who is capable of rendering aid and resuscitation.

Do Not Modify Test Equipment

Because of the added risk of introducing additional or unknown hazards, do not install substitute parts or perform any unauthorized modification to any Model ATRT-01 Test unit. To ensure that all designed safety features are maintained, it is recommended that repairs be performed only by Vanguard Instrument Co. factory personnel or by an authorized repair service. Unauthorized modifications can cause serious safety hazards and will nullify the manufacturer's warranty.

Follow Exact Operating Procedures

Any deviation from procedures described in this operator's manual may create one or more safety hazards, damage the ATRT-01 or the test transformer, or cause errors in the test results; VIC assumes no liability for unsafe or improper use of the ATRT-01.

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1.0 Introduction

The Model ATRT-01 is a microprocessor-based, field-portable, automatic, transformer, turns-ratio test meter designed for on-site measuring of: turns ratios, winding polarity, and no-load excitation currents of single and 3-phase utility transformers. The ATRT-01 can also test potential transformers (PTs) and primary current transformers (CTs). The ATRT-01 may not test some types of donut transformers (i.e., toroidal windings), since its not designed for that application.

2.0 Applicability

The ATRT-01 is available in three models: ATRT-01 (basic), ATRT-01B, and ATRT-01D.

a. The basic ATRT-01 is a line-powered 120/240 V ac (selectable), 50/60Hz unit.
b. The ATRT-01B is powered by a rechargeable lead-acid-gel battery cell. An ATRT-01B with a fully charged battery will provide a minimum 0f 4 hours of continuous operation. A built-in charger allows the ATRT-01B's battery to be recharged while it is testing.
c. The ATRT-01D is powered by 6 D-cell batteries (no ac is used). To conserve battery power, the ATRT-01D will automatically turn off after sitting idle for 1 minute. A fully charged set of batteries in the ATRT-01D provides power for up to 200 tests.

3.0 Operating Configuration

The ATRT-01 tests transformer ratio by applying an excitation voltage to primary (H) windings and monitors secondary (X) winding voltage. The users can also test 3-phase transformers using the ATRT-01. The user is required to connect the H and X cable leads to the appropriate windings for each phase. Since the ATRT-01 test lead connections to the (3-phase) transformer bushings are different for each phase, the ATRT-01 simplifies this procedure by displaying hook-up instructions on the LCD screen as testing progresses.

The ATRT-01 detects test-lead hook-ups for errors before a test: The ATRT-01 applies a low-level test voltage (300 mV) across the winding being tested and senses the induced secondary voltages. Any time an induced voltage is greater than the applied excitation voltage, it's detected as a hookup error. If a cross-connection error is detected, the ATRT-01 aborts the test and displays: “Hook-Up Error." But, if no hookup error is detected, the ATRT-01 applies a full 40-volt (20-volt for ATRT-01B/-01D) test voltage to the transformer being tested and the winding (voltage) ratio is displayed. Excitation current (in milliamperes) and winding polarity are also displayed.

The ATRT-01 lets users enter nameplate voltages for the specified turns-ratio calculation. From this calculated turns-ratio, the ATRT-01 will calculate and display the percentage of difference (based on the difference between the calculated and measured values).

A built-in RS-232C port allows the ATRT-01 to interface with an IBM PC. Transformer-testing program software, supplied with each ATRT-01, runs on an IBM Windows? -based computer and lets users control the ATRT-01 from a computer in the field. With a computer, users can run a test and save the test results in the field, then recall the test later in an office to generate a test report. Since data are stored in an ASCII format, test results can be exported into any database desired.

4.0 Principle of Operation

The ATRT-01 measures transformer turns ratio by applying a test voltage across the (H) winding and sensing induced voltage on the secondary (X) winding. (For safety, testing is always done in a step-down transfer, regardless of the transformer's actual use.) There's no load on windings during testing, so measured voltage ratio is virtually the same as the winding turns ratio. The ATRT-01 measures turns ratios in a range from 0.8 to 15,000. Excitation current (via H leads) is measured for reference and ranges from 0.0 to 2,000 mA (0 to 200 milliamperes for ATRT-01B and ATRT-01D). Winding polarity is displayed as "**+**" (in phase) or "**-**" (out of phase). The ATRT-01 calibrates its own sensing circuits before each test; therefore, calibration by the operator is not required.

5.0 Specifications

Model ATRT-01(v) specifications are listed below in Table 5-1

Table 5-1. Model ATRT-01 (v) Turns-Ratio Meter Specifications

(Unless otherwise indicated, each specification is the same for all three ATRT-01 models.)

Type	Portable, Automatic, Single-Phase Transformer Turns-Ratio Meter
Size (inches)	12 L by 8 W by 9 H
Weight (pounds)	ATRT-01: 8, ATRT-01B: 9.5, ATRT-01D: 9.5
Turns Ratio-Measuring Ranges	0.800 to 15,000.00
Turns-Ratio Accuracy	0.8-999: ?0.1 % 1,000-1,499: ?0.2 % 1,500-1,999: ?1.0 % 2,000-15,000: ?2.0%
Calibration	Self Calibrating; No operator calibration required
Excitation Voltage	ATRT-01: 40 Volts ac, ATRT-01B/ATRT-01D: 20 Volts ac
Excitation Current	ATRT-01: 2 amps, ATRT-01B/ATRT-01D: 0 to 200 milliamperes
Current Accuracy	? 2 % of Reading (? 1 Digit)
Winding Polarity	Displayed on LCD screen
Display	LCD: 20 Characters wide by 4 Lines, viewable in bright sunlight
Serial Interface	RS-232C, 19200 baud, 8 data bits, 2 start bits, 1 stop bit
Temperature	? Operating: -20 ?C to 55 ?C ? Storage: -40 ?C to 65 ?C
Warranty	One-Year on Parts and Labor

Table 5-2: ATRT-01, ATRT-01B, and ATRT-01D Cable Set

Item	Description	Qty
1	Test-Lead Cable, 15-foot Single-Phase Connections	1
2	Power Cord (Note 1)	1
3	RS-232C Cable	1

Note:
1. The ATRT-01D requires no power cord.
2. A Canvas Cable-Carrying Bag is included with the cable set.

6.0 Cable Marking and Identification:

Both H and X cable test leads are terminated with heavy-duty battery clips. Test cables are identified as follows:

Table 6-1. Cable Markings and Identification

Test Cable Name	Transformer Terminals	Clip Color	Identification
H Cables	H	Red	H1, H2
X Cables	X	Black	X1, X2

7.0 ATRT-01 Operating Controls And Indicators

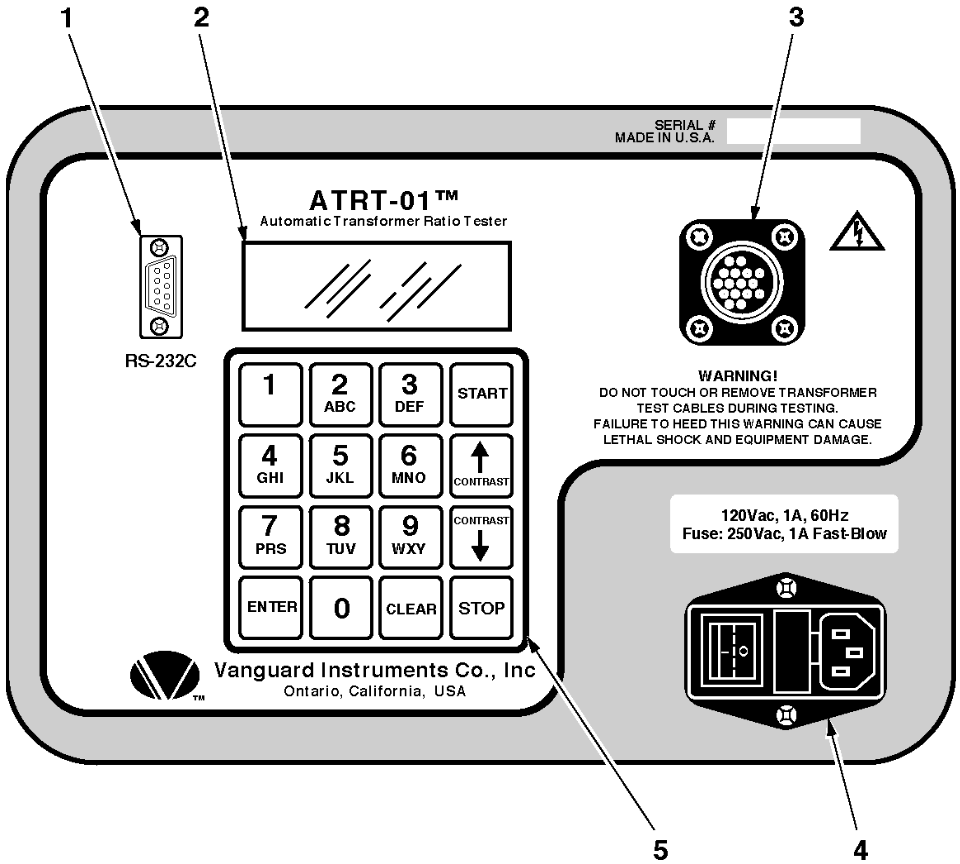


Figure 7-0. Model ATRT-01 Front-Panel Controls, Indicators, and Connectors

Fig. 7-0 Index	Panel Markings	Functional Description
1	RS-232C	Computer-Interface port, 9-pin, female DB type connector; RS-232C interface port allows ATRT-01 to interface with an IBM computer. Data rate is set to 19,200 baud, 1 start bit, 8 data bits, 2 stop bits, and no parity bit. Connector pin functions are: PIN SIGNAL 2 Tx 3 Rx 5 Gnd
2	None (display)	LCD screen: 4 line by 20 character; back-lighted, sunlight readable; Displays menus, test results, and status readouts.
3	None	High and Low voltage connector, 16-pin male.
4	120/220Vac, 1A, 50/60Hz	Input power connector and fused power switch with third-wire safety ground.
5	None (Keypad)	Pushbutton operating controls, 16-keys.

8.0 ATRT-01B Operating Control And Indicators

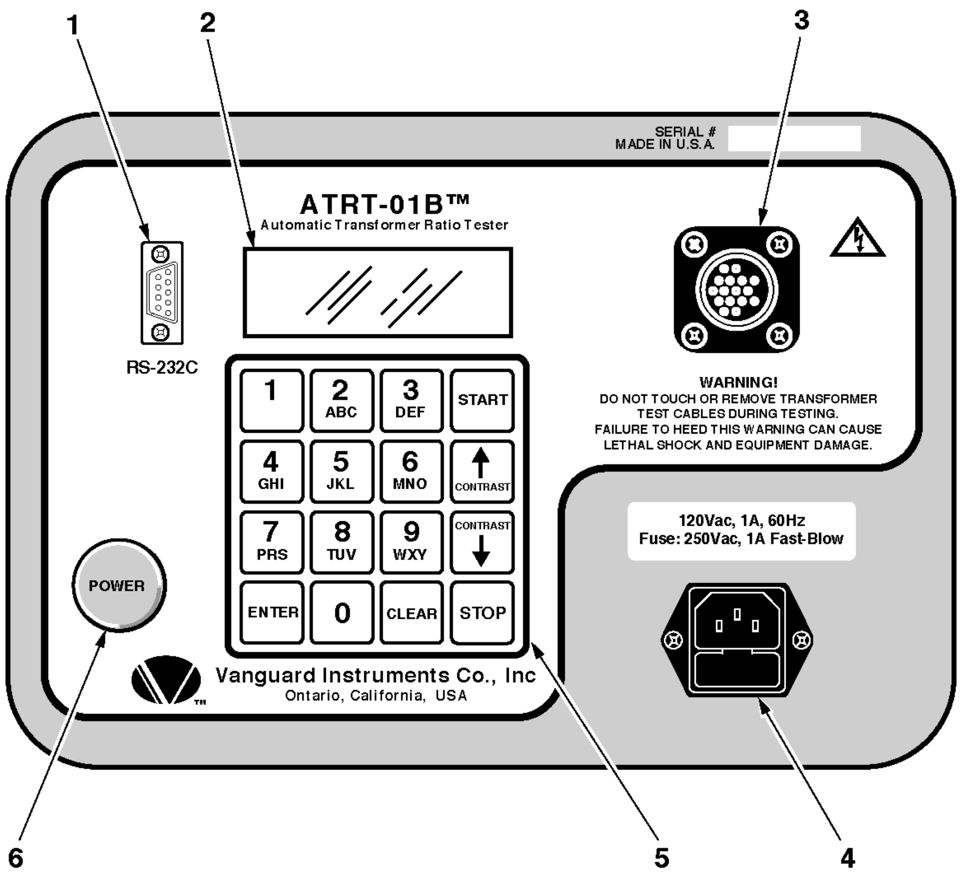


Figure 8-0. Model ATRT-01B Front-Panel Controls, Indicators, and Connectors

Fig. 8-0 Index	Panel Markings	Functional Description
1	RS-232C	Computer-Interface port, 9-pin, female DB type connector; This RS-232C interface allows ATRT-01B to interface with an IBM computer. Data rate is set to 19,200 baud, 1 start bit, 8 data bits, 2 stop bits, and no parity bit. PIN SIGNAL 2 Tx 3 Rx 5 Gnd
2	None (display)	LCD: 4 line by 20 character screen; backlighted, sunlight readable; Displays menus, test results, and status readouts.
3	None (H & X)	High voltage and Low voltage connector, 16-pin male.
4	120/220Vac, 1A, 50/60Hz	Input power connector with third-wire safety ground.
5	None (Keypad)	Pushbutton operating controls, 16-keys.
6	POWER	Power Switch, Momentary contact.

9.0 ATRT-01D Control And Indicators

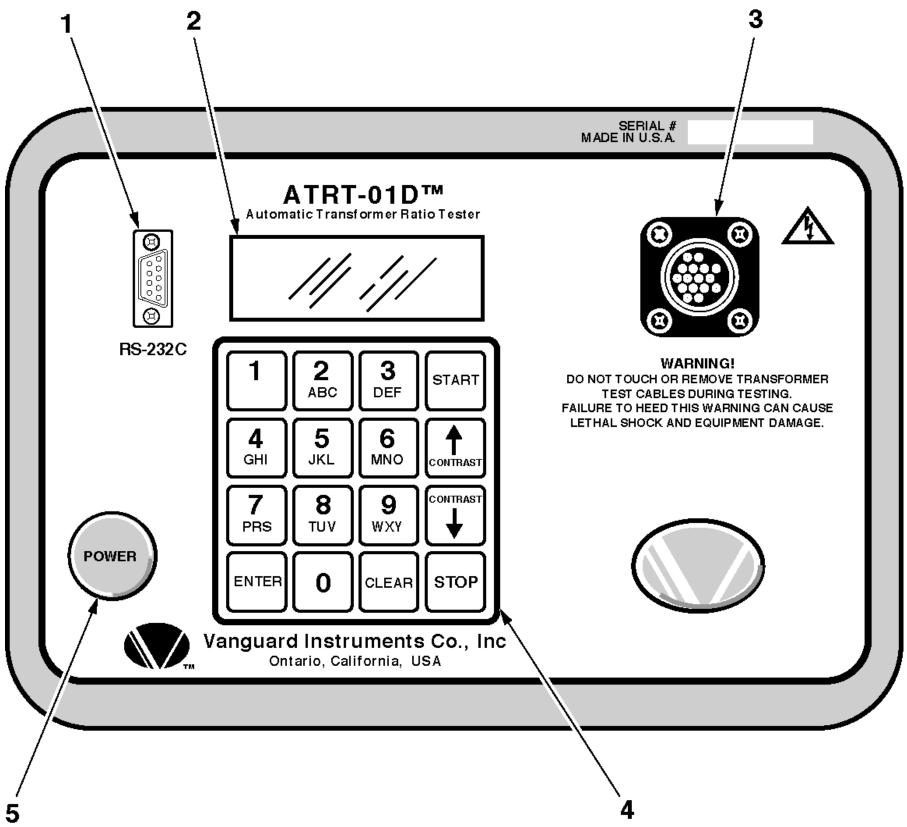


Figure 9-0. Model ATRT-01D Front-Panel Controls, Indicators, and Connectors

Fig. 9-2, Index	Panel Markings	Functional Description
1	RS-232C	Computer-Interface port, 9-pin, female DB type connector; This RS-232C interface port allows the ATRT-01D to interface with an IBM computer. Data rate is set to 19,200 baud, 1 start bit, 8 data bits, 2 stop bits, and no parity bit. PIN SIGNAL 2 Tx 3 Rx 5 Gnd
2	None (display)	Liquid-Crystal Display (LCD): 4 line by 20 character screen; backlighted, sunlight readable; Displays menus, test results, and status readouts.
3	None (H & X connector)	High voltage and Low voltage connector, 16-pin male.
4	None (Keypad)	Pushbutton operating controls, 16-keys.
5	POWER	Power Switch, Momentary.

10.0 ATRT-01 Power Switch Configurations

10.1 ATRT-01 Power Turn On/Off

The ATRT-01 is powered by ac line voltage only. The power is turned on and off with a power switch that is built into the power receptacle (see item 4 of Figure 7-0).

10.2 ATRT-01B Power Turn On/Off

The ATRT-01B is turned on or off by pressing POWER (see item 6 on Figure 8-0), on the front panel, for 2 seconds, then releasing the switch.

10.3. ATRT-01D Power Turn On/Off

The ATRT-01D is turned on or off by pressing the POWER switch (see item 5 on Figure 9-0), on the front panel, for 2 seconds, then releasing the switch.

11.0 ATRT-01B Charger Indicator

The CHARGE indicator is an LED that lights while the ATRT-01B battery is charging.

12.0 ATRT-01 LCD Control

12.1. Contrast Control

To Darken the LCD display, press and hold the "? Contrast" switch for two seconds; to lighten the LCD display, press and hold the "? Contrast" switch for two seconds.

12.2. Display Back-light Control

The ATRT-01 display is back-lighted. This light turns off after 30 seconds of operation to conserve power. To re-light the display, press any key on the keypad.

13.0 ATRT-01 RS-232C Computer-Control port

The ATRT-01 can be controlled remotely via an RS-232C port. The ATRT-01 computer control must be enabled before it can be controlled via the RS-232C port. (Refer to paragraph 24.0 for procedures to enable the interface control.)

14.0 IBM PC Transformer Analysis Software

IBM PC Transformer Analysis Software is delivered with each ATRT-01. This software allows the user to test transformer turns ratio via a PC. Test results may be saved and run later in a shop or an office environment. Such test-result records may also be saved in any user-specified database or archival records.

15.0 ATRT-01 Battery replacement

15-1. ATRT-01B Battery Replacement

Replace the ATRT-01B battery with the following: Panasonic part number LC-R122R2PU.

Note

A rechargeable lead-acid battery powers the ATRT-01B. A fully charged ATRT-01B can be continuously operated for 6 hours. A built-in charger lets the unit to be used during charging. Plugging the ATRT-01B into an ac power outlet after the battery is fully charged will not damage the battery. It is recommended that ***the ATRT-01B be plugged into an ac outlet*** when it's not in use.

15-2. ATRT-01D Battery Replacement

Replace ATRT-01D batteries with six standard Alkaline D-cell batteries.

16.0 DISPLAY and MENU DESCRIPTIONS

This section describes the operating menus of the ATRT-01.

16-1 Start-Up Menu

```
1. TEST XFMR      04/12/00
2. SETUP          13:06:02
3. CALCULATOR
```

Figure 16-0 Start-up menu

a. Description: The start-up menu lets the user test a transformer, set-up time, select computer interface, or use the calculator to manually enter voltage data for transformer ratio calculation.

b. Origin: The Start-up menu first displays after power is applied to ATRT-01.

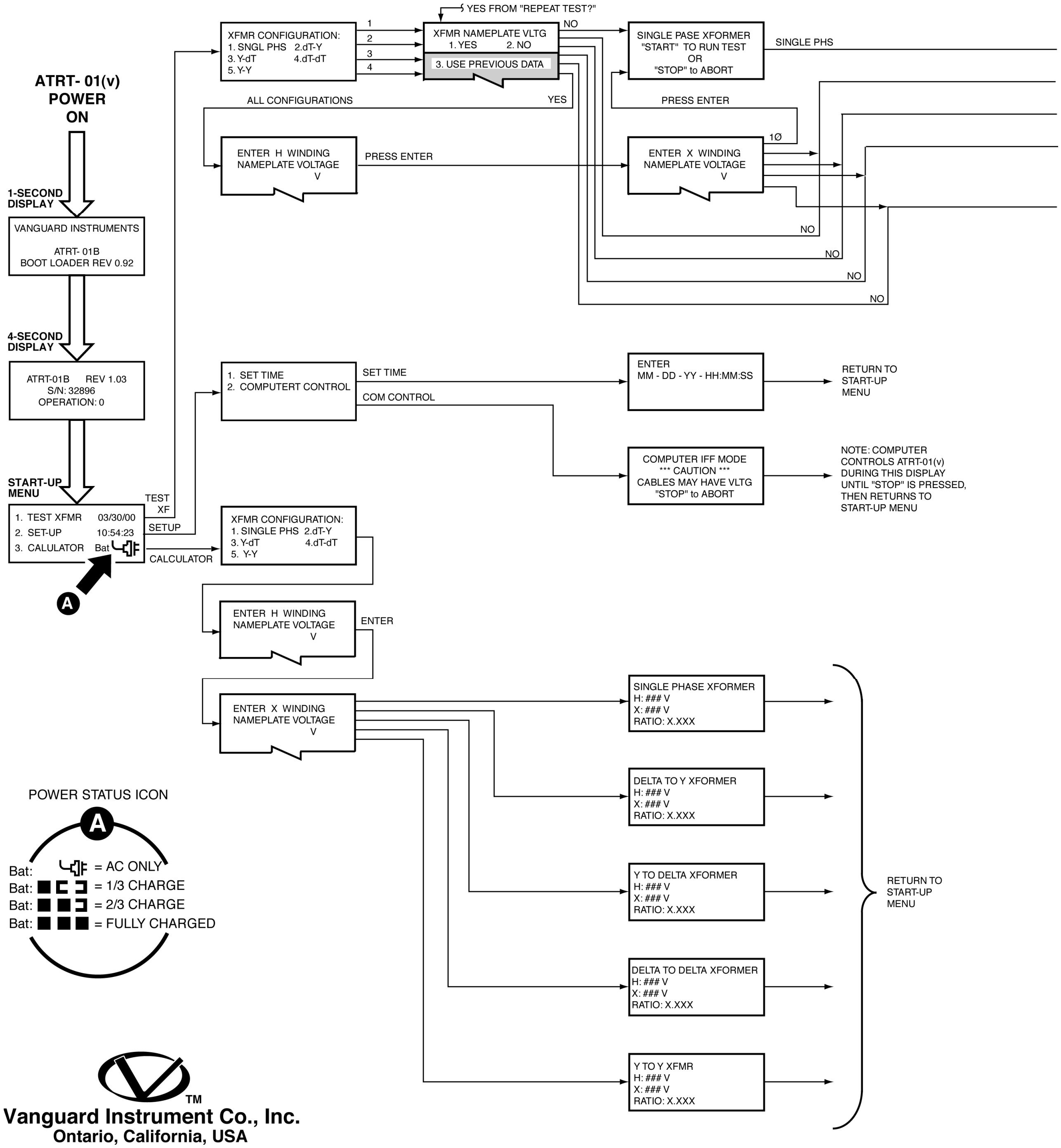
c. Action Options:

Press key 1 to initiate a transformer test.
Press key 2 to set clock or select computer interface.
Press key 3 to calculate transformer turns ratio.

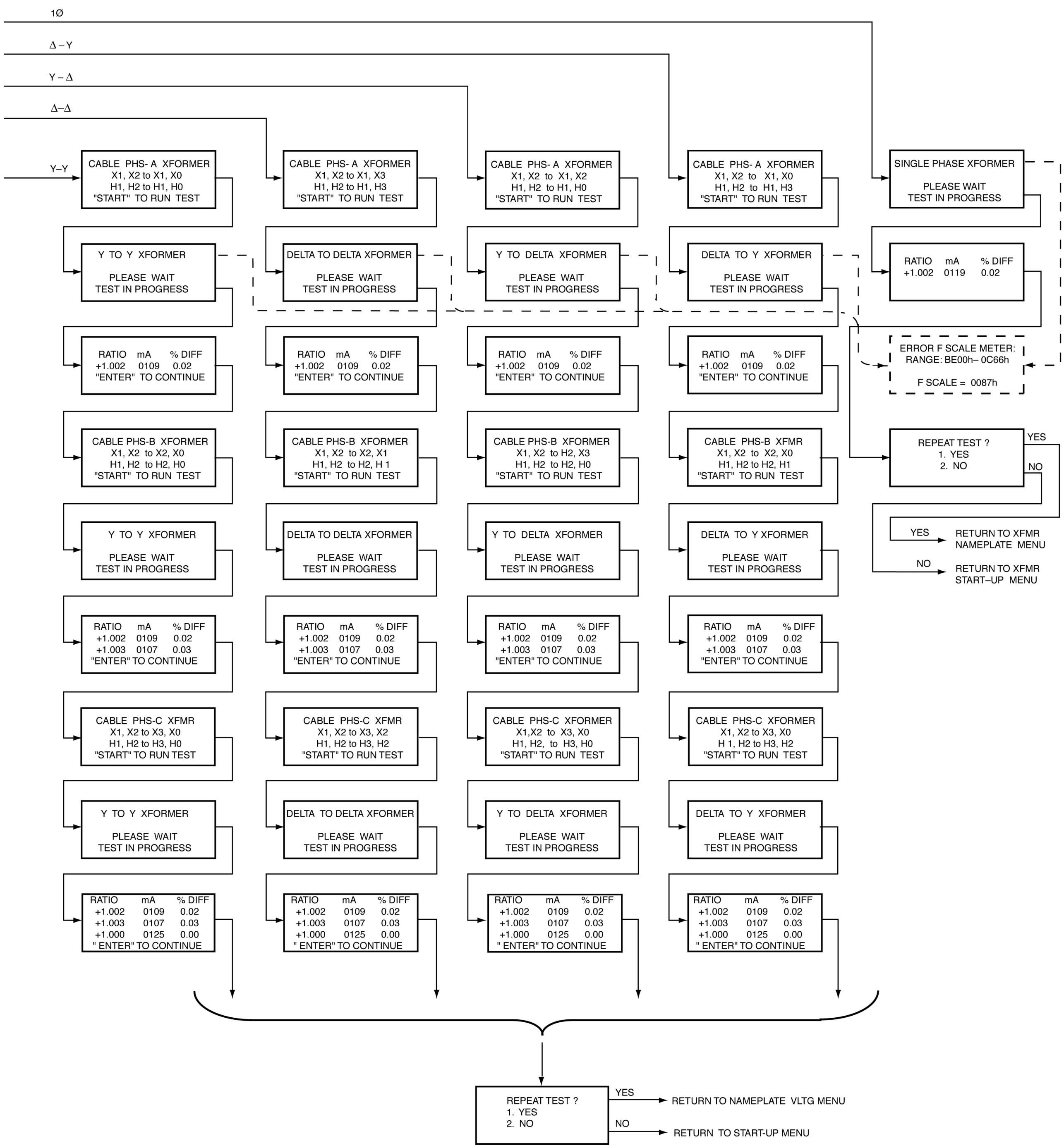
Note:

1. Real time and date is shown on top left of LCD screen.
2. See section 12.1 for LCD contrast control.
3. See section 12.2 for LCD back light control.

Figure 16-1 ATRT-01 Menu Diagram



Vanguard Instrument Co., Inc.
Ontario, California, USA


1Ø
Δ – Y
Y – Δ
Δ–Δ
Y–Y
CABLE PHS- A XFORMER X1, X2 to X1, X0 H1, H2 to H1, H0 "START" TO RUN TEST
Y TO Y XFORMER PLEASE WAIT TEST IN PROGRESS
RATIO mA % DIFF +1.002 0109 0.02 "ENTER" TO CONTINUE
CABLE PHS-B XFORMER X1, X2 to X2, X0 H1, H2 to H2, H0 "START" TO RUN TEST
CABLE PHS-C XFMR X1, X2 to X3, X0 H1, H2 to H3, H0 "START" TO RUN TEST
CABLE PHS- A XFORMER X1, X2 to X1, X3 H1, H2 to H1, H3 "START" TO RUN TEST
DELTA TO DELTA XFORMER PLEASE WAIT TEST IN PROGRESS
CABLE PHS-B XFORMER X1, X2 to X2, X1 H1, H2 to H2, H 1 "START" TO RUN TEST
CABLE PHS-C XFMR X1, X2 to X3, X2 H1, H2 to H3, H2 "START" TO RUN TEST
CABLE PHS- A XFORMER X1, X2 to X1, X2 H1, H2 to H1, H0 "START" TO RUN TEST
Y TO DELTA XFORMER PLEASE WAIT TEST IN PROGRESS
CABLE PHS-B XFORMER X1, X2 to H2, X3 H1, H2 to H2, H0 "START" TO RUN TEST
CABLE PHS-C XFORMER X1,X2 to X3, X0 H1, H2, to H3, H0 "START" TO RUN TEST
CABLE PHS- A XFORMER X1, X2 to X1, X0 H1, H2 to H1, H3 "START" TO RUN TEST
DELTA TO Y XFORMER PLEASE WAIT TEST IN PROGRESS
CABLE PHS-B XFMR X1, X2 to X2, X0 H1, H2 to H2, H1 "START" TO RUN TEST
CABLE PHS-C XFORMER X1, X2 to X3, X0 H 1, H2 to H3, H2 "START" TO RUN TEST
RATIO mA % DIFF +1.002 0109 0.02 +1.003 0107 0.03 "ENTER" TO CONTINUE
RATIO mA % DIFF +1.002 0109 0.02 +1.003 0107 0.03 +1.000 0125 0.00 " ENTER" TO CONTINUE
SINGLE PHASE XFORMER PLEASE WAIT TEST IN PROGRESS
RATIO mA % DIFF +1.002 0119 0.02
ERROR F SCALE METER: RANGE: BE00h– 0C66h F SCALE = 0087h
REPEAT TEST ? 1. YES 2. NO
YES
NO
YES RETURN TO XFMR NAMEPLATE MENU
NO RETURN TO XFMR START–UP MENU
REPEAT TEST ? 1. YES 2. NO
YES RETURN TO NAMEPLATE VLTG MENU
NO RETURN TO START-UP MENU

17.0 Test Transformer Selection

```
XFMR CONFIGURATION:
1.SNGL PHS        2.dT-Y
2.Y-dT            4.dT-dT
5.Y-Y
```

Figure 17-0 Transformer Selection menu

a. Description: This menu allows the user to select a particular transformer to be tested. If the user selects a three-phase transformer, the ATRT-01 will display hookup instructions (ATRT-01 cables to the transformer terminal bushing) for phases A, B, and C.

b. Origin: XFORMER CONFIGURATION menus display as a result of pressing key 1 from the start-up menu (see Figure 16.0).

c. Action Option: Press key 1, 2, 3, 4, or 5, depending upon the transformer configuration to be tested. Press STOP to return to the start-up menu.

18.0 Transformer Voltage Selection

XFMR NAME PLATE VLTG
1. YES
2. NO

Figure 18-0. Nameplate Voltage Selection Menu

a. Description: This menu allows the operator to use the transformer nameplate voltages to derive a calculated turns ratio. This calculated turns ratio is then used to compare with the measured turns ratio, which produces an error-difference percentage.

b. Origin: This menu is displayed after the operator selects the transformer type to be tested.

c. Action Option: Press key 1(yes) to use the calculated ratio in the test results. Press key 2 (no) to bypass this option.

19.0 Transformer Voltage Data Entry Menu

```
ENTER H WINDING
NAME-PLATE VOLTAGE:
V
```

Figure 19-1. H-Winding Voltage Entry Display

```
ENTER H WINDING
NAME-PLATE VOLTAGE:
7200V
```

Figure 19-2. H-Winding Voltage Entry Display

```
ENTER X WINDING
NAME-PLATE VOLTAGE:
V
```

Figure 19-3. X-Winding Voltage Entry Display

```
ENTER X WINDING
NAME-PLATE VOLTAGE:
480V
```

Figure 19-4. X-Winding Voltage Entry Display

a. Description: This menu allows the user to enter the H and X voltages of the transformer to be used in the turns-ratio calculation. The user must enter the transformer nameplate line voltages.

b. Origin: H and X voltage data entry menu will appear if the user select YES (key #1) on the Voltage-selection screen (see Figure 18-0).

c. Action Option: Press keys 0 thru 9 to enter transformer voltages. Press ENTER to confirm voltage entry. Press CLEAR key to re-enter input.

20.0 Start Test Menu

SINGLE PHASE XFORMER
"START" TO RUN TEST
OR
"STOP" TO ABORT

Figure 20-0. Start Test Screen

a. Description: This menu allows the user to start or abort a test.

b. Origin: After the user enters the nameplate voltages (see Figure 19-4) or selects NO on the "XFMR NAME PLATE VLTG Screen" (see Figure 18-0).

c. Action Option: Press START to start the test and press STOP to abort the test.

21.0 Transformer Turns-Ratio Test Result Display

```
RATIO    mA     %DIFF
+1.003   0002    0.3
```

Figure 21-0. Test Result Display

a. Description: The ATRT-01 displays the transformer turns ratio, excitation current (in milliamps), and turns-ratio error percentage. A typical turns-ratio test-result screen is shown on Figure 21-0, above.

Note
Ratio displayed: 1.003
Polarity displayed: "+" (in phase)
Excitation current: 2 ma
Percentage error: 0.3 %

b. Origin: This screen is displayed after the user presses START from the Start Test Menu.

c. Action Option: Press any key to return to the start-up menu (Figure 16-0).

22.0 Three Phase Transformer Test Cable Connection Display

CABLE	PHS-A	XFMR
X1, X2	to	X1, X0
H1, H2	to	H1, H3
"START" TO RUN TEST		

Figure 22-0. Cable Connection Display

a. Description: If a user is using the ATRT-01 to test a three-phase transformer, the transformer is tested one phase at a time. The user must connect the ATRT-01's H1-H2 and X1-X2 cable leads to the appropriate windings to produce turns-ratio readings for phases A, B, and C. The ATRT-01 displays the lead-to-bushing connection instruction (for each phase). By following the connection instruction, the ATRT-01 will lead the user through phase A, B, and C testing.

This feature reduces the probability of any hook-up error in the field.

b. Origin: Select a three-phase transformer from the XFMR CONFIGURATION menu (see Figure 17-0).

c. Action Option: Connect the ATRT-01 test leads to the transformer bushings, then press START to run test.

23.0 Set Time and Date

ENTER MM-DD-YY HH:MM:SS

Figure 23-0. Time and Date Display

a. Description: The ATRT-01 has a real-time clock powered with a back-up battery. The ATRT-01 displays the current time and date in the upper right of the start-up menu screen (see Figure 16-0).

b. Origin: Press key 2 (SET UP) on the start-up menu (Figure 16-0) and press 1 (SET TIME).

c. Action Option: Enter month, day, year, hour, minute, and second using key 0-9.

24.0 Enable Computer Interface

COMPUTER ITF MODE *** CAUTION! *** CABLE MAY HAVE VLTG “STOP” TO ABORT

Figure 24-0. Select Computer Interface Display

a. Description: ATRT-01 testing can be remotely controlled via an IBM-compatible PC through an RS-232C port. In this mode, the Transformer Analysis software provided with the ATRT-01 is used to test transformer windings.

b. Origin: On the Start-up Menu (see Figure 16-0), press key 2 (SET UP); then, on the next display, press key 2 (COMPUTER CONTROL) to show the COMPUTER ITF MODE display (the ATRT-01 testing remains under computer control for as long as this screen displays).

c. Action Option: Press STOP to abort computer control and return to the Start-up menu.

25.0 Step-by-Step Turns Ratio Testing Procedures

25-1 Single-Phase Transformer Test Procedure

Table 25.1 shows the steps to test a single-phase transformer.

Table 25-1. Single-Phase Transformer Test Procedure.

STEP	DESCRIPTION	DISPLAY	ACTION
1	Initiate Transformer Test	1. TEST XFMR 04/12/00 2. SETUP 13:06:02 3. CALCULATOR	Press key 1
2	Select Single Phase Transformer	XFMR CONFIGURATION: 1. SNGL PHS 2. dT-Y 3. Y-dT 4.dT-dT 5. Y-Y	Press key 1.
3	Select not to use transformer name plate voltage	XFMR NAME PLATE VLTG 1. YES 2. NO	Press key 2.
4	Start test	SINGLE PHASE XFMR "START" TO RUN TEST OR "STOP" TO ABORT	Press START key
5	Display ratio, excitation current	RATIO mA %DIFF +1.000 0002	None

25-2 Single-Phase Transformer Test Procedure using nameplate voltages

Table 25.2 shows the steps to test a single-phase transformer with transformer name plate voltages.

Table 25-2. Single-Phase Transformer Test (with name plate voltages) Procedure.

STEP	DESCRIPTION	DISPLAY	ACTION
1	Initiate Transformer Test	1. TEST XFMR 04/12/00 2. SETUP 13:06:00 3. CALCULATOR	Press key 1
2	Select Single Phase Transformer	XFMR CONFIGURATION 1. SNGL PHS 2. dT-Y 3. Y-dT 4.dT-dT 5. Y-Y	Press key 1.
3	Select to use transformer name plate voltage	XFMR NAME PLATE VLTG 1. YES 2. NO	Press key 1.
4	Enter H line voltage	ENTER H WINDING NAME-PLATE VOLTAGE V	Use keys 0-9
5	Confirm H line voltage	ENTER H WINDING NAME-PLATE VOLTAGE 7200 V	Press ENTER
6	Enter X line voltage	ENTER X WINDING NAME-PLATE VOLTAGE V	Use keys 0-9
7	Confirm X voltage	ENTER X WINDING NAME-PLATE VOLTAGE 480 V	Press ENTER
8	Start Test	SINGLE PHASE XFMR “START” TO RUN TEST OR “STOP” TO ABORT	Press START
9	Display ratio, excitation current, and percentage error.	RATIO mA %DIFF +15.003 01.00 0.02	None

25-3. Three-Phase Transformer Test Procedure using nameplate voltages

Table 25.3 shows the steps to test a three-phase transformer.

Table 25-3. Three-Phase Transformer Test Procedure.

STEP	DESCRIPTION	DISPLAY	ACTION
1	Initiate Transformer Test	**1. TEST XFMR 04/12/00 2. SETUP 13:06:00 3. CALCULATOR**	Press key 1
2	Select Delta to Y Phase Transformer	**XFMR CONFIGURATION 1. SNGL PHS 2. dT-Y 3. Y-dT 4.dT-dT 5. Y-Y**	Press key 2
3	Select to use transformer name plate voltage	**XFMR NAME PLATE VLTG 1. YES 2. NO**	Press key 1
4	Enter H line voltage	**ENTER H WINDING NAME-PLATE VOLTAGE V**	Use keys 0-9
5	Confirm H voltage	**ENTER H WINDING NAME-PLATE VOLTAGE 7200 V**	
6	Enter X line voltage	**ENTER X WINDING NAME-PLATE VOLTAGE V**	Use keys 0-9
7	Confirm X voltage	**ENTER X WINDING NAME-PLATE VOLTAGE 480 V**	Press ENTER
8	ATRT-01 display phase A cable connection	**CABLE PHS-A XFMR X1, X2 to X1, X0 H1, H2 to H1, H3 "START" TO RUN TEST**	Connect cables
9	Start phase A test	**CABLE PHS-A XFMR X1, X2 to X1, X0 H1, H2 to H1, H3 "START" TO RUN TEST**	Press START
10	Observe phase A test results	**RATIO mA %DIFF +15.003 001 0.02 "ENTER" TO CONTINUE**	None
11	ATRT-01 display phase B cable connection	**CABLE PHS-B XFMR X1, X2 to X2, X0 H1, H2 to H2, H1 "START" TO RUN TEST**	Connect cables
12	Start phase B test	**CABLE PHS-B XFMR X1, X2 to X2, X0 H1, H2 to H2, H1 "START" TO RUN TEST**	Press START

STEP	DESCRIPTION	DISPLAY	ACTION
13	Observe phase B test results	**RATIO mA %DIFF** **+15.003 001 0.02** **+15.015 001 0.10** **"ENTER" TO CONTINUE**	None
14	ATRT-01 display phase C cable connection	**CABLE PHS-B XFMR** **X1, X2 to X3, X0** **H1, H2 to H3, H1** **"START" TO RUN TEST**	Connect cables
15	Start phase C test	**CABLE PHS-C XFMR** **X1, X2 to X3, X0** **H1, H2 to H3, H2** **"START" TO RUN TEST**	Press START
16	Observe phase C test results	**RATIO mA %DIFF** **+15.003 001 0.02** **+15.015 001 0.10** **+15.000 001 0.00**	None

25-4 ATRT-01 Quick-Test Mode

The Quick-Test mode allows the user to measure transformer turn ratio with a single button command. To initiate the test, press and hole the “START” key for one second then release. The ATRT-01 will display the message below on the LCD.

“QUICK TEST” **HOLD START KEY UNTIL** **BEEP FOR QUICK TEST**

Figure 25-4 Quick Test Menu

25-5 Test Single Phase Transformer Using Preset Voltage Table

This special mode allows the user to quickly test a single phase transformer ratio and compare it’s reading against a name plate voltage. There are 46 transformer name plate voltages pre-program in the ATRT-01. To access this mode, press “CLEAR” key from the main menu (Fig 16-0); the ATRT-01 will display the following message:

? ? **SCROLL TO SELECT** **“START” TO RUN TEST** **H 2,400** **X 240**

Figure 25-5A Preset Voltage Menu

To select different name plate voltages, use the up or down arrow keys **“**? ? **”.** To initiate a test, press the “START” key. A typical test result is shown below:

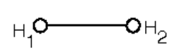
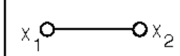
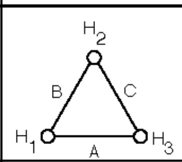
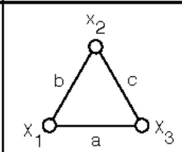
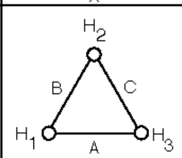
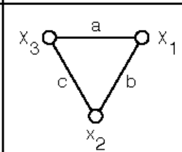
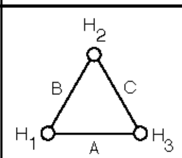
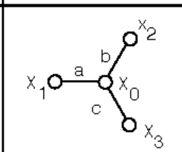
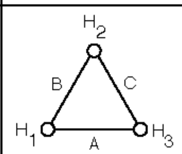
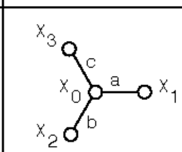
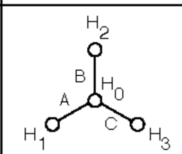
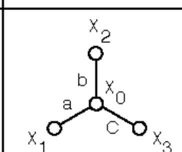
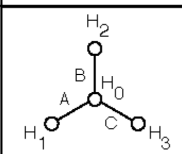
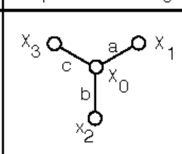
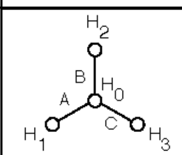
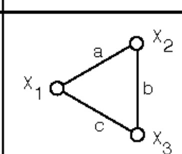
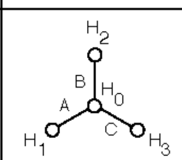
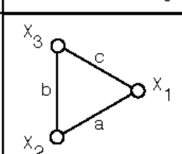
M-RATIO= +10.001 **ERROR= 0.11%** **PASS TTR TEST** **2,400/240 R=10.00**

Figure 25-5B Test Result Menu

Note:

In order to have the “PASS TTR TEST” message display, the reading error should be less or equal to 0.5% and the winding should be in phase.

APPENDIX A- TABLE OF TEST CONFIGURATION & CALCULATION FORMULAS

TEST NO.	TRANSFORMER CONFIGURATION HIGH-VOLTAGE WINDING (H)	TRANSFORMER CONFIGURATION LOW-VOLTAGE WINDING (X)	XFMR TYPE	PHASE	HIGH VOLTAGE WINDING	LOW VOLTAGE WINDING	TURNS RATIO
1			1 Ø STD	1 Ø	$H_1 - H_2$	$X_1 - X_2$	$\frac{V_H}{V_x}$
2			Δ–Δ STD	A	$H_1 - H_3$ (A)	$X_1 - X_3$ (a)	$\frac{V_H}{V_x}$
				B	$H_2 - H_1$ (B)	$X_2 - X_1$ (b)	
				C	$H_3 - H_2$ (C)	$X_3 - X_2$ (C)	
3			Δ–Δ REV	A	$H_1 - H_3$ (A)	$X_1 - X_3$ (a)	$\frac{V_H}{V_x}$
				B	$H_2 - H_1$ (B)	$X_2 - X_1$ (b)	
				C	$H_3 - H_2$ (C)	$X_3 - X_2$ (C)	
4			Δ–Y STD	A	$H_1 - H_3$ (A)	$X_1 - X_0$ (a)	$\frac{V_H \cdot \sqrt{3}}{V_x}$
				B	$H_2 - H_1$ (B)	$X_2 - X_0$ (b)	
				C	$H_3 - H_2$ (C)	$X_3 - X_0$ (c)	
5			Δ–Y REV	A	$H_1 - H_3$ (A)	$X_1 - X_0$ (a)	$\frac{V_H \cdot \sqrt{3}}{V_x}$
				B	$H_2 - H_1$ (B)	$X_2 - X_0$ (b)	
				C	$H_3 - H_2$ (C)	$X_3 - X_0$ (c)	
6			Y–Y STD	A	$H_1 - H_0$ (A)	$X_1 - X_0$ (a)	$\frac{V_H}{V_x}$
				B	$H_2 - H_0$ (B)	$X_2 - X_0$ (b)	
				C	$H_3 - H_0$ (C)	$X_3 - X_0$ (C)	
7			Y–Y REV	A	$H_1 - H_0$ (A)	$X_1 - X_0$ (a)	$\frac{V_H}{V_x}$
				B	$H_2 - H_0$ (B)	$X_2 - X_0$ (b)	
				C	$H_3 - H_0$ (C)	$X_3 - X_0$ (c)	
8			Y–Δ STD	A	$H_1 - H_0$ (A)	$X_1 - X_0$ (a)	$\frac{V_H}{V_x \cdot \sqrt{3}}$
				B	$H_2 - H_0$ (B)	$X_2 - X_0$ (b)	
				C	$H_3 - H_0$ (C)	$X_3 - X_0$ (c)	
9			Y–Δ REV	A	$H_1 - H_0$ (A)	$X_1 - X_2$ (a)	$\frac{V_H}{V_x \cdot \sqrt{3}}$
				B	$H_2 - H_0$ (B)	$X_2 - X_3$ (b)	
				C	$H_3 - H_0$ (C)	$X_3 - X_1$ (C)	

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